CLAIMS

What is claimed is:

1.   A character recognition apparatus comprising:

space storage to store, for a plurality of types of characters, Eigen spaces made from a plurality of rotated character images obtained by rotating first character images for the character types through a plurality of angles;

loci storage to store loci drawn for projection points obtained by projecting the plurality of rotated character images in the corresponding Eigen spaces for the plurality of character types;

an input unit to input images for recognition target characters;

a distance calculation unit to obtain distances for between projection points for the recognition target characters obtained by projecting images for the recognition target characters in Eigen space and each loci for the plurality of character types; and

a candidate selection unit to select candidates for images for the recognition target characters from the plurality of character types.

2.   The character recognition apparatus according to claim 1, wherein the candidate selection unit selects only the candidate for which the calculated distance is shortest and decides upon this as the character type of the recognition target character.

3.   The character recognition apparatus according to claim 1, wherein the candidate selection unit decides the angles of rotation of the recognition target characters.

4.   The character recognition apparatus according to claim 3, wherein the candidate selection unit decides angles of rotation of the recognition target characters through

prescribed calculations using projection points of the recognition target characters and the two neighboring points on a locus.

5.   The character recognition apparatus according to claim 1, wherein the candidate selection unit projects each of the plurality of rotated character images in Eigen space of a number of dimensions sufficient to be meaningful with respect to character recognition.

6.   The character recognition apparatus according to claim 1, further comprising:

image storage to store, for the plurality of character types, a plurality of rotated character images obtained by rotating one character image for a character type through a plurality of angles;

a space producing unit to produce the Eigen spaces for the plurality of character types from the plurality of rotated character images stored in the image storage and storing the spaces in the space storage; and

an image projecting unit to obtain loci from a plurality of projection points obtained by projecting the plurality of rotated character images stored in the image storage in the Eigen spaces corresponding to the plurality of rotated character images stored in the space storage and storing the loci in the loci storage for the plurality of character types.

7.   The character recognition apparatus according to claim 6, further comprising:

a locus interpolation unit to obtain interpolation points interpolated from the plurality of projection points obtained by the image projecting unit using prescribed processing for the plurality of character types,

wherein the image projecting unit stores the loci contained in the interpolation points obtained by the locus interpolation unit in the loci storage for the plurality of character types.

8. The character recognition apparatus according to claim 7, wherein the locus interpolation unit carries out spline interpolation to interpolate the plurality of projection points obtained by the image projecting unit using periodic splines.

9. The character recognition apparatus according to claim 7, wherein the locus interpolation unit has a table to store coordinates and angles for the plurality of projection points obtained by the image projecting unit and for interpolation points obtained by the locus interpolation unit, and obtains the distances and angles of rotation for the recognition target characters using the table.

10. The character recognition apparatus according to claim 1, further comprising:

a candidate comparison unit to compare candidates selected by the candidate selection unit and deciding character types for the recognition target characters.

11. The character recognition apparatus according to claim 10, wherein the candidate comparison unit obtains a plurality of rotated character images by rotating the recognition target characters through prescribed angles, obtains a plurality of projection points by projecting the plurality of rotated character images in Eigen spaces corresponding to the candidates selected by the candidate selection unit, and takes the candidate of the candidates selected by the candidate selection unit closest to the plurality of projection points as the character type of the recognition target character.

12. A character recognition method comprising:

preparing, for a plurality of types of characters, Eigen spaces made from a plurality of rotated character images obtained by rotating first character images for the character types through a plurality of angles;

preparing loci drawn for projection points obtained by projecting the plurality of rotated character images in the corresponding Eigen spaces for the plurality of character types;

inputting images for recognition target characters;

obtaining distances for between projection points for the recognition target characters obtained by projecting images for the recognition target characters in Eigen space and each loci for the plurality of character types; and

selecting candidates for images for the recognition target characters from the plurality of character types.

13. A character recognition program for implementing a character recognition method for a character recognition apparatus on a computer, wherein the program causes the computer to execute:

preparing, for a plurality of types of characters, Eigen spaces made from a plurality of rotated character images obtained by rotating first character images for the character types through a plurality of angles, and loci drawn for projection points obtained by projecting the plurality of rotated character images in the corresponding Eigen spaces;

inputting images for recognition target characters;

obtaining distances for between projection points for the recognition target characters obtained by projecting images for the recognition target characters in Eigen space and each loci for the plurality of character types; and

selecting candidates for images for the recognition target characters from the plurality of character types.